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ABSTRACT

This study presents an evaluation of the effect of group size on the frequency with which young children ask questions. Subjects for the study were 32 preschool children (16 boys, 16 girls) ranging in age from 3.1 to 6.2 years. The children were divided into two non-overlapping age groups with mean ages of 3.6 and 5.2 years respectively. Each child participated in three experimental sessions during the same day: once alone, once with one same-sex peer and once with three same-sex peers. During each session, the children were given a set of three-dimensional objects (containing, for example, a fishing reel, desk sorter, lantern bottom, preserved frog in a bottle and a miniature metal chair and were invited to "take them out, play with them, and ask any questions about them if you like." The number of questions asked was obtained from videotapes of the sessions made in an adjoining screened observation booth. Results indicated that the frequency of questions asked per child was negatively related to group size, although two children as a group generated more questions than did children tested in groups of four or alone. Despite variations in group size and materials, the frequency of questions was correlated across sessions. No significant correlations were found between the number of questions asked and age or sex. (BD)

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Group Size as a Determinant of Preschool Children's Frequency of Asking Questions

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Abstract

Two preschool children ranging from 3.1 to 6.2 years of age were shown a set of "interesting" materials by their teachers while alone, with one other same-sex peer, and with three other same-sex peers. As predicted, the frequency of questions asked per child was negatively related to group size, though two children as a group generated more questions than did children tested in groups of four or alone. Despite variations in group size and materials, the frequency of questions was also correlated across sessions. However, there were no relationships between either age or sex and the number of questions.

Group Size as a Determinant of Children's Frequency of Asking Questions

In the absence of available research, teachers of young children arrange the size of their instructional groups based on their hunches about its impact on the children's cognitive activity. For example, of concern to teachers are the optimal group size conditions for inducing children to seek and examine new information contained in a given set of instructional materials. Yet, with regard to one class of inquiry behaviors--asking questions of the teacher--the present authors are aware of only one study which attempted to evaluate the effects of group size on the frequency with which young children in these groups asked questions (12).

Briefly, using groups of kindergarten children ranging from four to 24 in size, Torrance found that the larger the group, the fewer the questions. For example, his four-child groups asked about twice as many questions as a group than did his 24-child groups. On a per child basis the effects appear to be even more dramatic. More specifically, it can be readily inferred from Torrance's data that the children in the four-child groups asked about 12 times as many questions on a per child basis as did the children in the 24-child groups, since the latter groups contained six times as many children as did the former groups.

Of particular interest to the present investigators were Torrance's findings and conclusions regarding his four- and six-child groups. First, Torrance concluded that the group mean differences were inconsequential (mean number of questions for the four- and six-child groups were 31.1 and 28.1, respectively). Yet on a per child basis, substantial

differences existed even between these similar group size conditions, as each child in the six-child groups asked only 60 percent as many questions as did each child in the four-child groups.

Second, based on his own teaching experiences with young children, Torrance indicated that small groups may possess a "possible superiority" over individual tutorial situations (p. 74). If "superiority" in the present context is taken to mean generating more questions from children, then no information was provided by Torrance to determine if groups smaller than four would generate more or fewer questions than groups of four or larger. However, given the compelling inverse trend found by Torrance coupled with our own experiences regarding the number of questions young children ask during brief individual sessions (3), we anticipated that both on a per child and a per group basis, the inverse trend between questions and group size would extend to groups of four and below. Thus, as described in more detail in the Methods section, we compared the number of questions asked by children when tested in groups of four (4G), two (2G), and when tested alone ("1G").

Of secondary interest were possible age and sex differences in question-asking frequency, as well as evidence regarding the degree to which individual differences in question-asking are stable across different group size conditions and stimulus materials. While several studies exist to indicate that question-asking frequency increases with age among school age children (1, 6), the evidence is less clear or consistent for preschool children (2, 7, 11). Similarly, no clear-cut sex differences in question-asking frequency has emerged from the literature involving preschool cihldren (4, 5, 8). Finally, despite evidence for considerable individual variation in the incidence of

questions asked among even homogeneous samples of normal middle class white children (3), investigators have not yet provided evidence for the stability of these individual differences across time and situation.

Method

Subjects

The subjects were 16 boys and 16 girls enrolled in a university preschool program. The children were predominantly from white, middle-class, two-parent families. While no intelligence test scores were available, based on past records of the children normally enrolled in the program and teacher judgements of the present sample, all of the children were judged to be of at least average intelligence. Mean age of the children was 4.4 years, and they ranged from 3.1 to 6.2 years of age. The 32 children were divided evenly into two non-overlapping age groups (younger and older preschool groups) whose mean ages were 3.6 and 5.2, respectively.

Stimulus Materials

Eighteen three-dimensional items were collected from a larger pool of items used by the first author in previous research (3). Since most of the objects used in the present study were similar to those used by Mathieu (7), her conceptual categories for classifying the items were adopted. Specifically, each item was first assigned to one of the following categories: 1) container items; 2) items with several moving parts; 3) items with a few moving parts; 4) items possessing interesting textual properties; 5) biological artifacts; and 6) novelty items. The three items assigned to each category were then randomly selected to be included in one of three sets of six objects. The items composing each set are breifly described as follows:

Set 1--desk sorter, fishing reel, lantern bottom, preserved frog in bottle, miniature metal chair.

Set 2--contact lens case, french-fry cutter, shoe stretcher, copper scrubber, preserved turtle in bottle, replica of St. Louis Arch.

Set 3--purse flashlight, crank puzzle box, hamburger press, buffer brush, stuffed squirrel, metal statue of Indian goddess.

Procedure

On three separate occasions during the same day, each child accompanied his (her) student teacher to an unused playroom, once with three other same sex peers (4G), once with one other same sex peer (2G), and once alone ("1G"). The three test sessions were each six minutes long, and were separated by at least 10 minutes and more typically 20 minutes from preceding or succeeding sessions. Compositon of the groups was randomly determined within the restrictions that all group members be of the same sex and age group, and that all pair members be formed from those children making up the four-child groups.

A random half of the children within each age-sex subgroup received the group size sessions in the following order--4G-2G-"1G"; the remaining half received the sessions in the reverse order--"1G"-2G-4G. (These two sequences were selected as the best compromise available in making group size comparisons using a within-subjects design. The more statistically defensible alternative of using three sequences of an order such that each group size would appear equally often in all three positions was prohibited by the limited sample of children available).

At the beginning of the session the student teacher invited the children to kneel on a small area rug located in the center of the room. Surrounding the rug on three sides were low partitions which served to separate the

testing area from the rest of the room which had otherwise been left undisturbed. The teacher produced a paper sack containing one of the three sets of items which had been randomly assigned to the session, and said the following: There are some things in the sack for you to look at. You can take them out, play with them, and ask any questions about them if you like. No other comments were necessary since the children always began immediately to remove the items from the sack.

The children were encouraged to remain on the area rug while playing with the objects, but otherwise their play activities were unrestricted. The teacher, who was unaware of the purpose of the project, was merely encouraged to answer the children's questions as simply and as directly as she might do under ordinary conditions.

Recording Questions

Each session was video-taped by an observer located in an adjoining screened observation booth. The taped sessions were played back and questions were transcribed verbatim. Questions were defined as interogative statements or any other inflected statements which involved a request for information about either the stimulus materials presented, or about any other objects, persons, or activities which were present in or absent from the experimental sessions. Permission questions (e.g., Can I have this?) as well as information-seeking questions repeated by the same child or by another child in the same session were not included in the totals.

Reliability in transcribing and scoring the questions was obtained by comparing the judgements of two raters who independently judged the tapes of seven randomly selected sessions. The number of questions scored by each judge on each minute of the 42 minutes composing the seven sessions was .99 ($p < .01$).

Results

Per Child Analysis

Correlational analysis revealed that the number of questions did not vary significantly with age either among the boys or the girls (r's = .06 and -.06, respectively). Therefore, age was ignored as a variable, and a three-way analysis of variance was performed on the data in which group size was a "within" effect and sex and order ("1G"-2G-4G, 4G-2G-"1G") were "between" effects.

Inspection of Table 1 and results of the analysis combined to reveal that neither sex or order, either alone or in interaction, were significantly related to the frequency with which the children asked questions.

Insert Table 1 About Here

On the other hand, it is apparent from Table 1 that regardless of order, the predicted decrease in questions with an increase in group size was obtained. This predicted pattern was clearly significant as revealed in the main effect for group size, $F = 49.92$ (2/56), $p < .01$, and in the follow-up pair-wise comparisons, all F's > 23.41 (1/56), all p's $< .01$.

Separate correlations between the frequency of questions asked between "1G" and 2G, "1G" and 4G and between 2G and 4G yielded r's of .39, .37, and .68, respectively (all p's $< .05$). Thus, there was a significant degree of consistency in the number of questions individual children asked over the three group size conditions. While the 2G-4G correlation appears to be particularly robust, it was not significantly larger than the other two correlations.

Per Group Analysis

To test whether the group size conditions significantly influenced the number of questions produced on a per group basis, the total number

of questions generated by all four children in each of the eight 4G groups were treated as basic scores in the analysis. Eight "1G" and eight 2G scores were then obtained by taking the total number of questions produced within each set of four children while they were being tested under the "1G" and 2G conditions and dividing these totals by 4 and 2, respectively, in order to adjust them for the number of persons contributing to each total.

A one-way repeated measures analysis of variance performed on the transformed per group totals yielded a significant effect for group size, $F = 3.83$ (2/14), $p < .05$. Follow-up F tests indicated that the 20.3 questions asked per group by the children when in the 2G condition was signficantly higher than the 14.4 generated per group when in 4G, $F = 7.11$ (1/14), $p < .05$. It was also larger than the 16.5 questions asked by the children when in 1G, but this difference was significant at only the 10 percent level, $F = 3.83$ (1/14), $p < .10$. However, the "1G"-4G per group difference was not significant. Thus, the predicted inverse relationship of group size to total questions per group was confirmed when comparing 2G to 4G, but not when comparing "1G" to either 2G or 4G.

Discussion

Group Size

The present findings extend those of Torrance in showing that even among groups of four or less, the frequency of asking questions per child is inversely related to group size. Therefore, if the emphasis is on generating questions from each child, the individual tutorial situation remains "superior" to a group situation, no matter how small the group.

On the other hand, the per group totals suggest that groups of two preschool children may produce more questions as a group than either

larger groups or even then individual children alone with their teachers. The enhancing effects on group totals of the dyadic (2G) situation found in the present study should be treated with some caution, for the possibility exists that 2G, by virtue of its second position in both order conditions, somehow received a unique order treatment that was not present in either "1G" or in 4G. Nevertheless, there is at least one other recent study with preschool children which also found that a 2G situation enhanced the information-seeking efforts of preschool children over that of "1G" (9). More specifically, Rabinowitz et al. found that two children exploring a novel toy discovered some new information about it sooner than did individual children exploring the same toy by themselves.

It might be contended that the per child measure was a less appropriate measure than the per group measure since the time to ask questions was confounded with the size of the group due to the fact that a given child would not be able to ask his (her) question while another child in the group was asking one. However, this criticism is relevant only if it can be demonstrated that children did not have adequate time to ask their questions. In fact, however, in none of the 56 sessions (32 "1G"'s + 16 2G's + 8 4G's) did the children and teacher spend more than a third of the six-minute period engaging in question-answer exchanges. Moreover, regardless of the condition, the majority of questions typcially occurred within the first two minutes of the sessions.

It is our position that both measures may be potentially useful and are psychological meaningful(though somewhat different) indices of the cognitive-educational processes occuring among children as they seek information from their teachers. For example, in support of the per group measure, children would be expected to benefit from hearing

questions asked by other children that they themselves would not have thought to ask. Therefore, in line with the evidence of the "optimizing" effects of 2G over 4G and "1G", it would be important in further research to discover if there are, in fact, different group sizes for different age groups of children and for different tasks that maximize the total number of questions that would be asked in those situations. The availability of such knowledge would enable teachers to arrange the sizes of their groups in order to maximize the potential information avialable to each child in the group.

On the other hand, there are also theoretical and empirical reasons to believe that a per child measure is important. For example, Ross and Balzer (10) found that first, third, and fifth grade children remembered more of the information contained in answers to their own questions than to the questions asked by another child in a 2G condition. Again, further research is needed to clearly determine the extent to which the retention of information given to others as compared to oneself varies with age and group size, as well as with a host of other potential situational factors.

Individual Differences

Neither the children's age or sex proved to be related to the frequency with which they asked questions. The negative findings regarding age are consistent with Mathieu's results (7) involving preschool boys who were studied under conditions that were highly similar to those in the present investigation. However, the Mathieu study and the present one stand in contrast to several earlier investigations which found age and number of questions to be positively related (1, 2, 11, 13). Numerous differences in methodology, materials, and ages sampled between the earlier studies and both the present one and that by Mathieu should provide a useful source of hypothesis for further research concerning age trends in question-asking.

However, one difference that may account for at least a portion of the inconsistent findings is that the earlier studies, unlike the recent ones from our laboratory, increased their chances of finding age changes by using children who varied widely (at least five years) in age.

The present study also provides another score for no sex differences among preschool children in question-asking frequency to chalk up against the studies yielding sex differences favoring boys (8) and those involving sex differences favoring girls (5). It is apparent to the present investigators that the picture will become no clearer until social, task, and other situational factors are systematically evaluated.

Finally, despite the fact that age and sex were not predictive of questioning performance, the substantial individual differences that did exist among the children were nevertheless consistently reflected over the three group size conditons. Of particular interest to us was the fact that the G2-G4 correlation (of .68) appeared to be particularly robust, while the other two correlations involving G1 and the two bonafide group conditions were rather more modest (.39 and .37, respectively for G2 and G4 with G1). As mentioned previously, the correlations were not significantly different from each other. Nevertheless, it is tempting to speculate that some set of "group dynamics" factors (e.g., dominance, independence, attentiveness to peers) may have contributed to the larger correlation, but were absent in the smaller correlations involving G1 since it, of course, was not a group situation. It would seem that a promising line of research would be to examine the interpersonal relationships found within groups that make them more successful contexts for some children and less successful ones for others as they seek new information about their environment.

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